1,099,185

PATENT SPECIFICATION

DRAWINGS ATTACHED

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Int. Cl.:—B 32 b 3/12.

COMPLETE SPECIFICATION

Acoustical Panels

We, BALDWIN-EHRET-HILL, INC., a Corportation organised and existing under the laws of the State of Pennsylvania, United States of America, of 500 Bruenig Avenue, Trenton, State of New Jersey, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the art of acoustical panels, more particularly to an improved acoustical panel in which the sound deadening properties are subject to selective variation by the designer, and in which the exposed surface of the panel may have any of a variety of desired decorative arrangements or coverings formed thereon without interfering with the sound deadening properties of the panel.

As conducive an an understanding of the invention, it is noted that a variety of different types of acuostical panels have been evolved for use on walls, ceilings, floors, or the like partitioning structures employed to enclose any area in which it woud be desirable to deaden or dissipate noise in the enclosed area. The sound absorptive properties of a material are generally dependent on the porosity and softeness of the material, whereby the sound to be deadened is trapped within the pores of the material, and the vibrational energy of the sound dissipated by the flexing of the material. It is, however, found that the use of these sound deadening materials in fabricating acoustical panels produces a relatively soft surface panel subject to marring, and of such structural weakness as to become distorted with time, Additionally, the porous nature of conventional sound absorbing materials tends to accumulate dirt, and any attempts to paint or clean the exposed surfaces of these acoustical panels either clogs the pores thereof with resultant elimination of the sound deadening properties, or produces further deterioration of the panel.

It is accordingly among the objects of the invention to provide an improved acoustical panel having an exposed surface subject to ready cleaning or other maintenance procedures.

Another object of the invention is to provide an improved acoustical panel with an exposed surface which may be painted or otherwise treated without interfering with the sound deadening material of the panel.

A further object of the invention is to provide an acoustical panel with improved means for trapping sound in proximity to the sound deadening material of thhe panel.

Another object of the invention is to provide an improved sound deadening panel having a relatively strong exposed surface in which the rigidity and strength of the surface does not produce undesired reverberation of the sound waves impinging thereon.

According to the invention, an improved acoustical tile embodying the instant invention is formed by means of a sound absorptive element such as conveniently available intercellular or fibrous board. Cellulose boards, mineral fiber boards, glass-fiber or rockwool may readily be employed. Arranged over the surface of the sound absorptive element which is normally intended for positioning in sound receiving position with respect to the area in which sound is to be deadened, is a cellular lattice. Which may be fabricated of any one of a large variety of materials such as paper, sheet metal, plastic or the like. Expanded paper board is found particularly suitable and may be arranged in the form of a honeycomb so that the lattice defines a plurality of cells adjacent the sound receiving surface of

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the sound absorptive element. a rigid perforate covering sheet formed of any one of a large variety of suitable rigid sheet materials such as sheet steel, or rigid sheet plastic is secured over the lattice with the perforations of the covering sheet permitting transmission of sound through said sheet to the cells defined by the ltatice The covering sheet is selected from that class of materials subject to ready cleaning, painting, or the provision of desired decorative motifs thereon.

A feature of the invention resides in the sound trapping properties of the lattice which acts to form a resonator trapping the sound in proximity to the sound absorptive element to insure damping of the sound.

In the accompanying drawings in which are shown one or more of various possible embodiments of the several features of the invention,

Fig. 1 is a schematic cross sectional view through a room or the like area showing the novel acoustical panel employed as a ceiling tile.

Fig. 2 is a perspective view with parts broken away of an acoustical panel made in accordance with the teachings of this invention and on a larger scale.

Fig. 3 is a cross sectional view taken on line 3-3 of Fig. 2 showing the details of the structural components of the panel,

Fig. 4 is a fragmentary details sectional view showing an acoustical panel made in accordance with the teachings of this invention in which the edges of the covering panel are turned up to enclose the lattice and sound absorbing board to provide a clean joint between panels, and

Fig. 5 is a view similar to Fig. 4 of a panel provided with a non-sound transmitting back coating on the sound absorptive board.

Referring now to the drawings, the acoustical panel 10 is shown as constructed for use as a ceiling tile.

As shown in the drawings, the acoustical panel 10 is formed by a sound absorptive element 11 such as intercellular or fibrous board. Sound absorptive board 11 may be made of cellulose board, mineral board, fiber board, glass-fiber rockwool, or the like.

The density, and thickness of the sound absorptive element is selected, dependent on the sound absorptive qualities desired, and production and handling considerations.

In the illustrative embodiment of the invention, only the undersurface 12 of the board 11 is shown as intended for sound impingement thereon. To this sound impinging surface 12 is secured a lattice 13 the walls of which define a plurality of cells 14. The lattice 13 may be fabricated in a variety of ways of a large variety of materials. Thus, paper board, sheet plastic, molded plastics, or molded fiber board, or the material employed for the sound absorptive element itself may be employed in fabricating the lattice. The term "lattice" is intended to mean an arrangement whereby the materials or parts forming the lattice provide a number of adjacent enclosed areas or cells 14 over the surface of the board 11.

By way of example, it is found that expanded paper board stock arranged in the illustrated honeycomb lattice may be satisfactorily employed. This paper board stock lattice 13 is secured to the sound impinging surface of the sound absorbing board 11 by the use of glue or the like adhesives.

It has further been found that better sound damping properties are obtained by forcing the edge of the lattice 13 into the sound absorptive board 11 as shown in Fig. 3 which thereby serves to improve the sound transmitting properties of the lattice with respect to the sound absorbing board.

Arranged over the lattice 13 to sandwich the lattice between itself and the sound absorbing board 11 is a covering plate 15 formed with a plurality of spaced perforations 16. Covering plate 15 is formed of a rigid sheet material such as a rigid sheet plastic, or any one of that class of materials having desired structural rigidity. Sheet steel is found particularly suitable. The perforations 16 are spaced so as to insure the free passage of air through the covering plate 15 to the cells 14 defined by the walls of lattice 13. The materials of which the covering plate are formed are selected from a class of material subject to ready maintenance, ready cleaning and having desired textures suitable for use in the areas in which the plate is employed. Covering plate 15 is secured to the lattice by utilization of conventional fastening techniques. Thus, when expanded paper board is employed for forming the lattice, paper bonding adhesives have been found paricularly suitable.

Alternatively, it will be understood by those skilled in the art that the covering plate and the lattice may be integrally molded of materials such as metal or plastics within the scope of the invention.

In the Fig. 4 embodiment of the invention, the panel board 410 is shown as formed to provided a plurality of discrete panel sections. The panel board 410 is substantidentical to the panel board 10 as illustrated in Figs. 2 and 3. However, the configuration of the covering plate 15 is made such as to provide this covering plate 15 with a plurality of upturned peripheral edges 416 which serve to define a discrete panel, and implement the installation of the panels to provide a clean straight joint

between abutting panels.

As shown illustratively in Fig. 5, the rear surface of the panels 10, on that face of the sound absorptive board 11 obverse to the sound impinging undersurface 12 thereof, as illustrated, will be formed with a sound transmission loss coating 50 such as vinyl, enamel, or the like coating materials providing a relatively impervious surface.

In use, the afore-described panel board may be made of any suitable dimensions. Where formed of the conventional rectangular panels, these panels are arranged to cover the area which it is intended to provide with desired sound deadening properties. Thus, as best shown in Fig. 1, the panels 10 are shown as arranged to provide sound deadening ceiling tiles. The ceiling tiles 10 are shown suspended by supporting channels C depending from hangers H in conventional fashion.

It is thus seen that a simple effective sound deadening panel has been provided in which desired sound deadening properties are obtained by utilization of the conventional sound absorptive materials. However, the soud absorptive materials have their sound deadening properties enhanced by the provision of resonating cells which serves to trap the sound to be deadened in proximity to the sound absorptive surface, and the exposed covering panel 15 is formed of a material which serves the two-fold function of providing a reverberating surface to reflect the sound entrapped within the cells back to the sound deadening surface, and additionally provides a rigid surface to implement the formation of desired decorative finishes and permits the ready cleaning of the wall of ceiling panel.

WHAT WE CLAIM IS :—

1. An acoustical panel comprising a sound absorptive element having a surface adapted for arrangement in sound receiving position with respect to any area in which sound is to be deadened, a cellular lattice positioned over the sound receiving surface of said sound absorptive element, said lattice defining a plurality of cells, and a rigid perforate covering plate arranged over said lattice, the perforations of said plate permitting the transmission of sound through said plate to the cells defined by said lattice.

2. An acoustical panel as in Claim 1 in which said covering plate is formed of a rigid sheet material subject to having desired surface textures for coatings applied and maintained thereon.

3. An acoustical panel as in Claim 1 or 2 in which the edge of said cellular lattice adjacent said sound absorptive element is forced into the sound absorptive element.

3. An acoustical panel as in Claim 1 or 2 in which the edge of said cellular lattice adjacent said sound absorptive element is forced into the sound absorptive element.

4. An acoustical panel substantially as described and as shown in the accompanying drawings.

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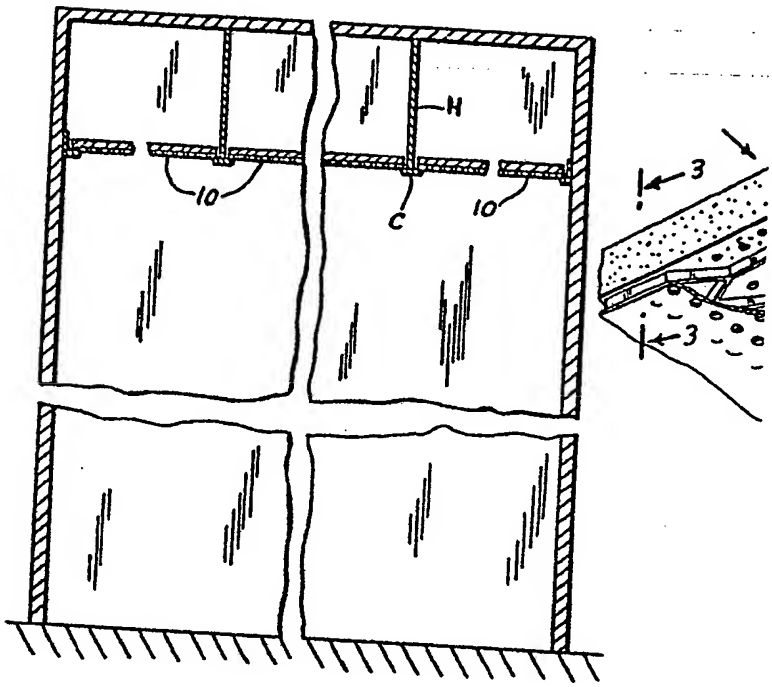
FIG. 1



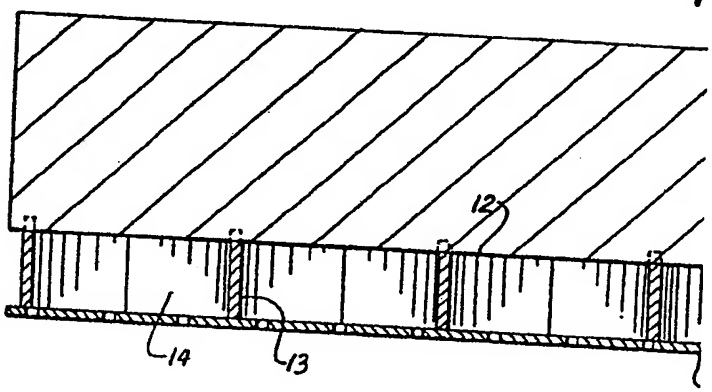


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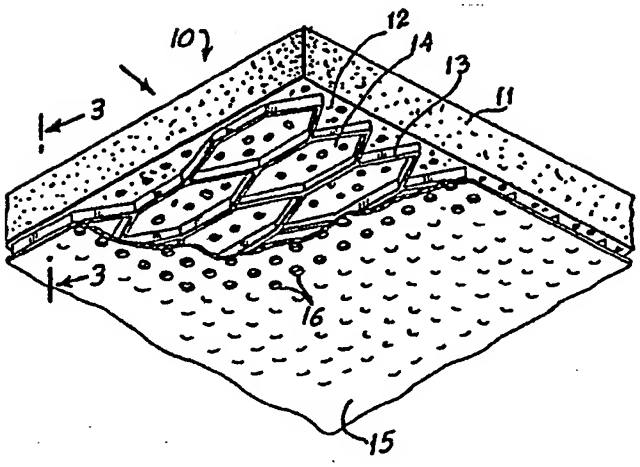
FIG. 2



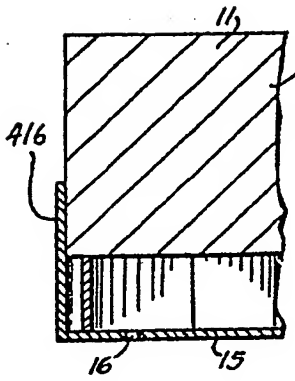
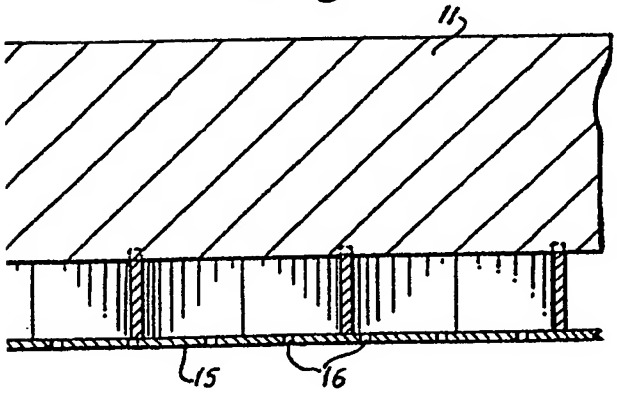


FIG. 4

FIG. 3



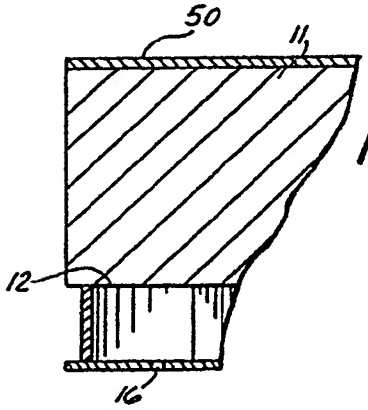


FIG. 5

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FIG. 1

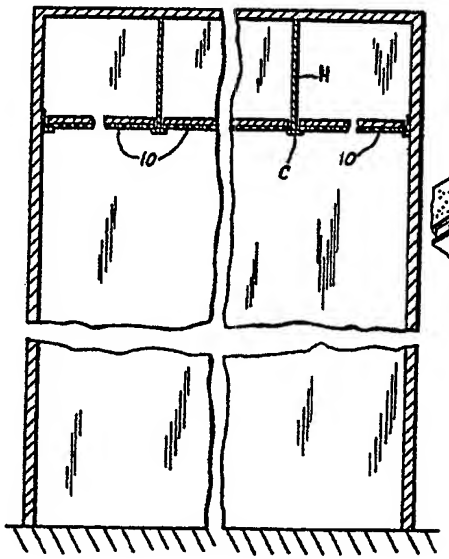
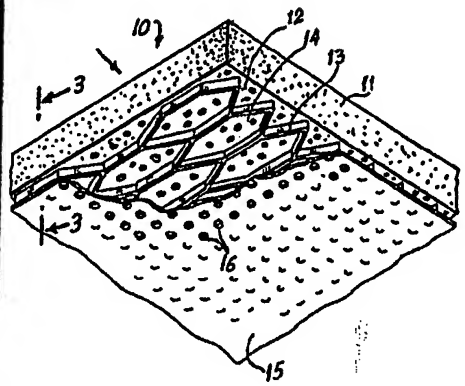


FIG. 2



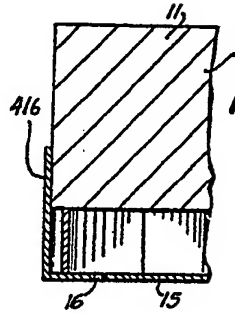


FIG. 4

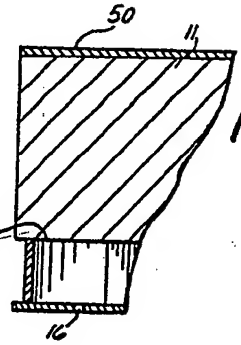


FIG. 5

FIG. 3